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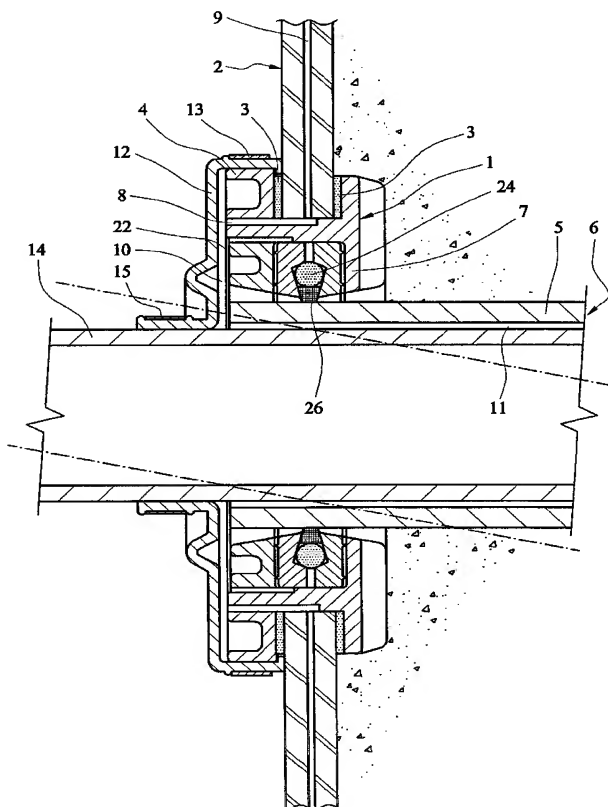
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(54) Title: PIPE SEAL



(57) Abstract: A pipe seal (1) is disclosed which comprises a main body portion (7) adapted to be fixed to the wall of a chamber, tank, or the like, a face plate (22) adapted to be secured to the body portion (7) to surround, in use, a pipe (6) to be sealed, the body (7) and face plate (22) between them housing a deformable member (24) in contact with a seal (26), such that, on forcing the face plate (22) toward the body portion (7), the deformable member (24), in use, deforms and presses the seal element (826) into sealing contact with the pipe (6), characterised in that the seal (1) has a port (8) which in use is connectable to the interstitial space (9) of a double walled container (2). The seal (1) may be provided with a further port (10) which is, in use, connectable to the interstitial space (11) of a double walled pipe (6) and which is in turn connectable to the first port (8).

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*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

## PIPE SEAL

This invention relates to a pipe seal and more particularly relates to a seal for a pipe entering a double walled chamber.

Throughout industry there are many examples of pipes and cables terminating at equipment housed within tanks or chambers. Typically these chambers are thin-walled and at the point of entry the pipe is sealed to the tank wall. In installations where the tank or chamber is below ground level, there is a need to seal the pipe to prevent the ingress of ground water. More recently, in view of environmental legislation, it has become increasingly important to ensure that any chemicals, held within or spilled within the chamber, are contained and do not enter the ground and cause contamination.

In order to meet environmental and safety standards, many chambers, particularly those used in petrol station forecourts, are now double-walled, and indeed many pipes entering such chambers are double-walled also. The interstitial spaces can be checked to ensure that there is no leakage either of groundwater into, or fuel out of, the system. Ideally, the interstitial spaces should be continuously monitored from a remote location, e.g. the kiosk in a petrol station forecourt.

Pipes entering a chamber either connect to equipment within the chamber or form a junction with other pipes. In either case it is not always possible for the pipe to enter at 90 degrees to the chamber wall.

In our copending PCT patent application no. PCT/GB02/01857, there is described a pipe seal which comprises

a main body portion adapted to be fixed to the wall of a chamber, tank, or the like,

a face plate adapted to be secured to the body portion to surround, in use, a pipe to be sealed,

the body and face plate between them housing a deformable member in contact with a seal,

such that, on forcing the face plate toward the body portion, the deformable member, in use, deforms and presses the seal into sealing contact with the pipe.

The present invention seeks to provide a modified form of the pipe seal which is capable of connecting to the interstitial space of a double-walled chamber so as to be able to continuously or intermittently monitor the integrity of the chamber and/or associated pipe system.

According to the present invention there is provided a pipe seal of the type described having a port which in use is connectable to the interstitial space of a double walled container.

Preferably, the seal also has a further port which is, in use, connectable to the interstitial space of a double walled pipe and which is in turn connectable to the first port.

The design of this pipe seal allows the integrity of the system to be tested by various methods. In a preferred method, vacuum can be applied to the interstitial spaces of any specific group of seals and pipes, and the rate of decay monitored thereby allowing the integrity of the system to be established. This method is described in European Patent Publication No. 0875746 and is especially suitable at the point of installation owing to the very short test times, typically of the order of one minute.

For long term continuous monitoring it is preferred to fill the interstitial spaces with a fluid, preferably containing a colouring dye for ease of identifying leaks. The fluid level should be set at a level above the highest ground water level that the system will encounter thus maintaining a positive pressure on the seal. In this way, if a leak occurs, it will be the fluid within the interstitial space that leaks out, and monitoring of the fluid levels will identify such a leak. If the leak enters the sump the dye will help identify the leak and allow corrective action. If the leak is from the main sealing element and out into the ground then it will be necessary to check the tightness of these seals or replace the seal. The fluid used should therefore be non-contaminating.

As the seal is generally of the form described in our above-mentioned PCT application, the pipe is able to enter the chamber wall at an angle of, for example, up to 12 degrees from a right angle. Hence the end of a pipe could generate a cone of movement with an included angle of 24 degrees. The seal therefore permits considerable positional movement of the pipe to allow connection of the pipe to its termination point within the chamber.

The main body portion may be generally annular in shape and may be attached to the chamber wall by, e.g., a ring nut. Alternatively the body could be welded or heat sealed to the wall, especially where the latter is made of a plastics material.

The face plate may be attached to the body by one or more, preferably a plurality of, bolts and associated nuts. Tightening the nuts and bolts may deform the deformable member in the cavity formed between the plate and body. The face plate may also be generally annular in shape as it, together with the main body, surround the pipe in use. Alternatively, where smaller diameter pipes are to be sealed, the deformable member and seal may be contained within a cassette arrangement. The face plate may be replaced by a clamping ring and the bolts dispensed with as will be described more fully in our above mentioned PCT patent application. This has the advantage that a number of pipe sizes can be accommodated merely by replacing the cassette.

The deformable member is preferably a ring of elastomeric material such as nitrile rubber. The cavity in which it is held is open along an annular portion adjacent the pipe so as to contact the seal and force it against the pipe.

The seal may also be of an elastomeric material but it is preferred to use a chemically inert material such as polytetrafluoroethylene, e.g. Teflon. The seal is preferably in the form of a plurality of split rings so that it can be removed and replaced when necessary without having to disconnect the pipework.

Situations can arise where it is necessary or desirable to isolate temporarily the interstitial spaces to allow maintenance work or independent monitoring of each individual space. An

embodiment of the invention includes an additional seal and clamp operable to reversibly seal the two interstitial spaces from one another.

The invention will now be described further, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a longitudinal sectional view of a pipe seal in accordance with the invention in place on the wall of a double-walled sump;

Figure 2 is a similar view to Figure 1 of a modified form of seal suitable for isolating the interstitial space of the sump from that of the pipe;

Figure 3 is a similar view to Figure 1 showing an extended semi-flexible seal capable of being clamped to either or both of the double walled pipes; and

Figure 4 is a sectional view taken on line A-A in Figure 3.

Referring to the drawings, and in particular Figure 1, a pipe seal 1 is sealed to a double walled sump 2 by seals 3 which are clamped in place by a ring nut 4. The outer pipe 5 of a dual containment pipe system 6 is sealed by the pipe seal 1 and terminates approximately flush with the inside face of the pipe seal 1. The pipe seal 1 comprises a main body 7 and face plate 22 between them housing a deformable member 24 in contact with a seal 26 such that, on forcing the face plate toward the body portion, the deformable member deforms and presses the seal into contact with the pipe 5, as more fully described in our above-mentioned WO02/088588.

Main body 7 of the pipe seal 1 has one or more small channels 8 provided in the outer threaded surface of the main body 7. These channels 8 form a port connected to the interstitial space 9 of the double walled sump 2. The channels are further connected to a sealed space 10 which in turn constitutes a port connected to the interstitial space 11 of the double walled pipe 6. The sealed space 10 is defined by a semi-flexible seal 12 which is clamped to the ring nut 4 by band clamp 13 and to the inner pipe 14 of the dual containment pipe 6 by band clamp 15.

Referring to Figure 2, and using like numerals for like parts, in situations where it is not required to connect to the interstitial space 9 of the double walled sump 2 to that of the pipe 6, then the two seals 3 are replaced by a single continuous seal 16 which, when clamped by ring nut 4, isolates interstitial space 9 from pipe seal 1.

Now turning to Figures 3 & 4, the outer pipe 5 of the dual containment pipe system 6 extends beyond the pipes 1 and the semi-flexible seal 12 is replaced by an extended seal 17 (known in the art as a 'boot'). The boot 17 is clamped to the pipe 14 with a band clamp 15 as before creating the sealed space 10.

The boot 17 has an additional sleeve area 19 provided with a band clamp 20 capable of sealing the boot to the outer pipe 5. The sleeve 19 is of larger diameter than the pipe 5 and therefore allows continuation of the sealed space 10 from the pipe seal 1 to the interstitial space 11 of the dual containment pipes. However, should it be required to isolate space 9 from space 11, the band clamp 20 can be tightened causing the sleeve portion 19 of the boot 17 to seal to the pipe 5 and cut off communication between the respective spaces. Untightening the band clamp 20 restores communication.

As can be seen from Figure 4, the inside face of the sleeve 19 can be provided with small raised ribs 21 around its circumference to help ensure continuity of the space 10 in the area of the sleeve 19. The boot 17 is preferably made of an elastomeric material such as Alcrin or Pellethane which allow the ribs 21 to flatten under the pressure of the band clamp 20 when it is tightened. The latter material is clear and therefore has the added advantage that the user can visually inspect the seal for leaks.

The pipe seal of this invention provides a simple and cost effective mean of connecting the interstitial space, provided by a dual containment pipe system, to a pipe seal or pipe seals via the interstitial space of a double walled sump. The sealed connection is so designed as to permit intermittent or continuous monitoring of the integrity of the seals, sump and dual containment pipe work.

## CLAIMS

1. A pipe seal which comprises

a main body portion adapted to be fixed to the wall of a chamber, tank, or the like,

a face plate adapted to be secured to the body portion to surround, in use, a pipe to be sealed,

the body and face plate between them housing a deformable member in contact with a seal,

such that, on forcing the face plate toward the body portion, the deformable member, in use, deforms and presses the seal into sealing contact with the pipe,

characterised in that the seal has a port which in use is connectable to the interstitial space of a double walled container.

2. A seal as claimed in claim 1 provided with a further port which is, in use, connectable to the interstitial space of a double walled pipe and which is in turn connectable to the first port.

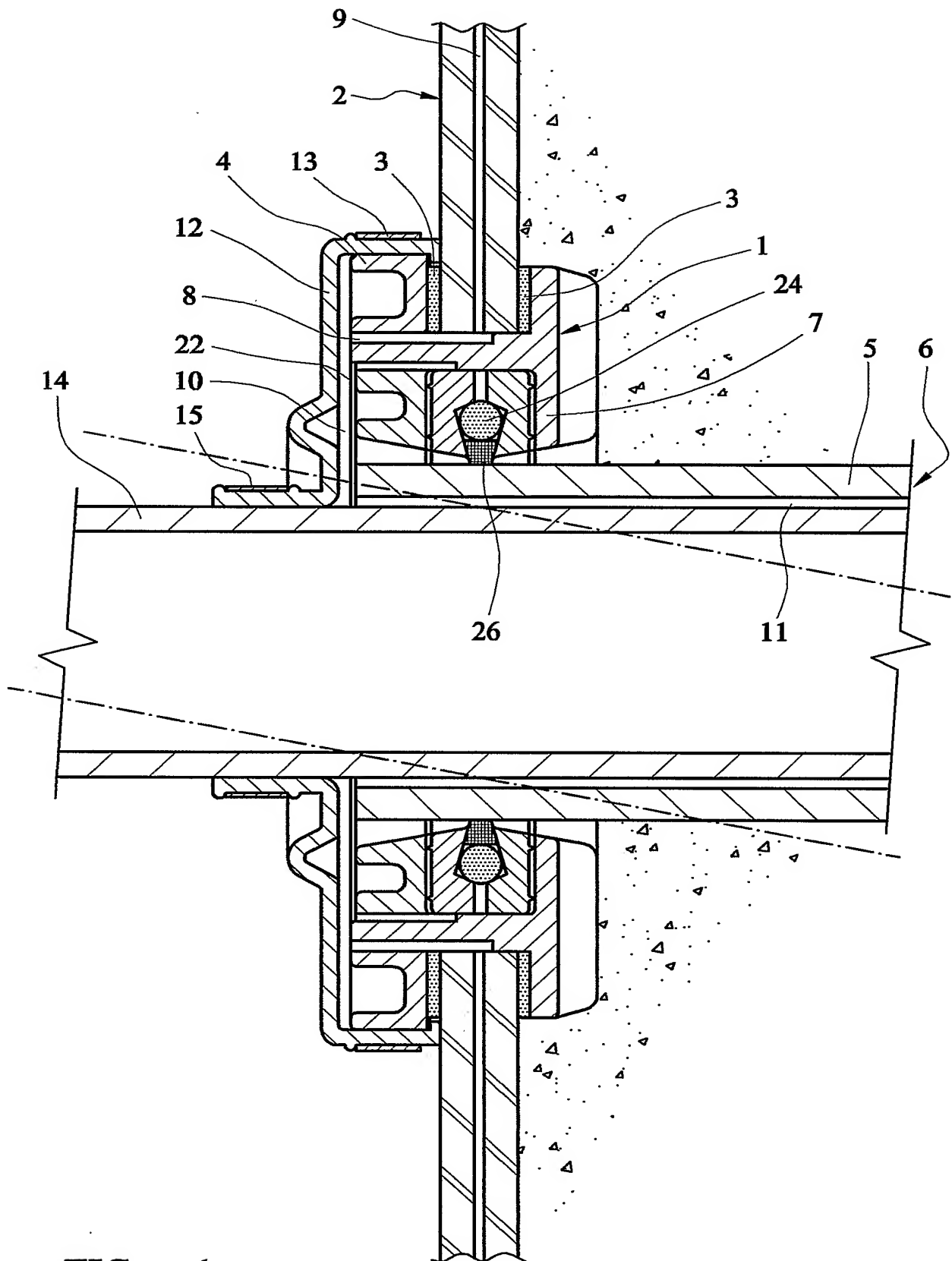
3. A seal as claimed in either of claims 1 or 2 in which the main body portion is generally annular in shape and is attached to the chamber wall.

4. A seal as claimed in claim 3 wherein the main body portion is attached to the wall by a ring nut.

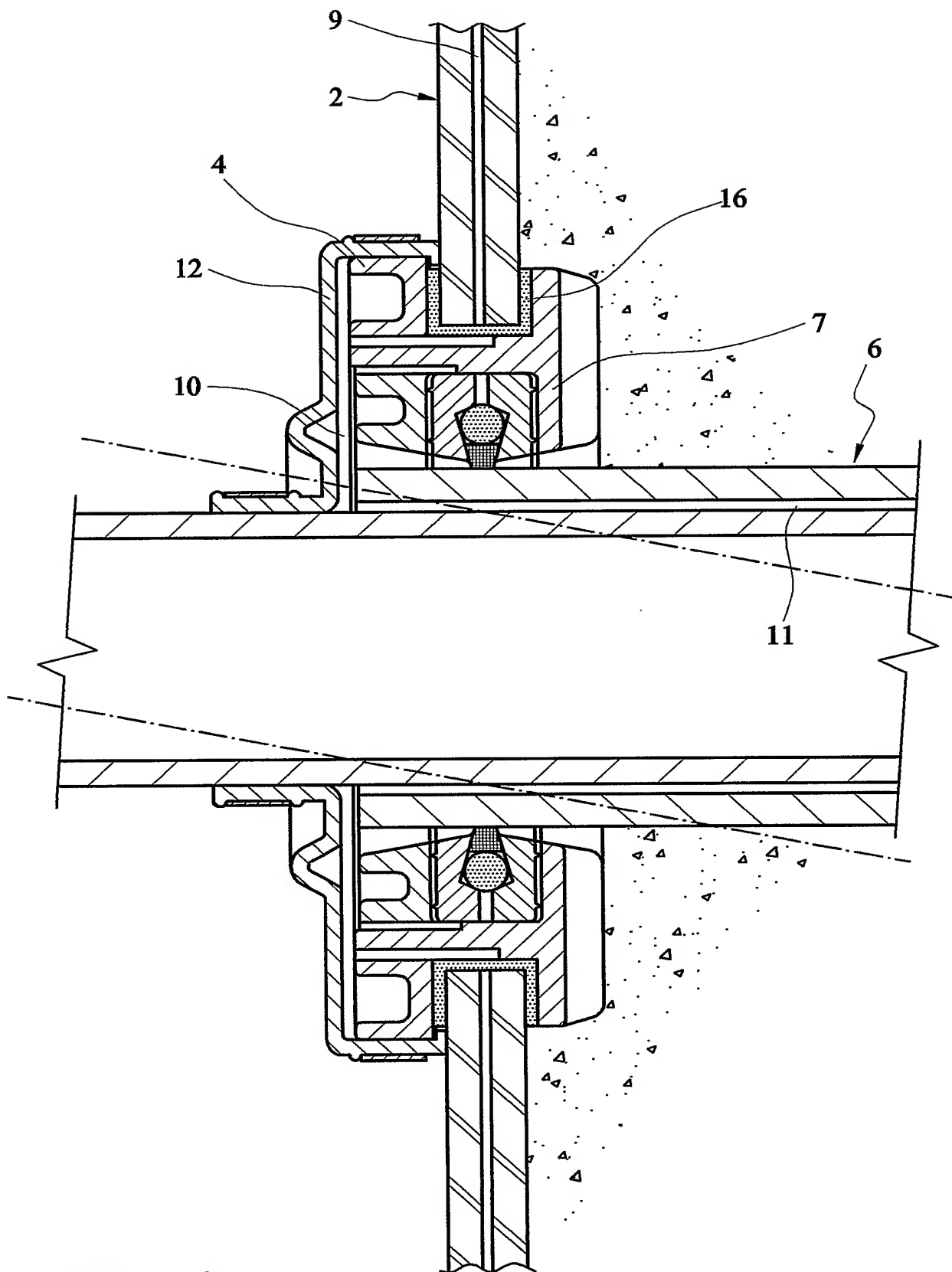
5. A seal as claimed in claim 3 wherein the main body portion is attached to the wall by welding or heat sealing.



6. A seal as claimed in any of claims 1 to 5 in which the face plate is attached to the body by one or more, preferably a plurality of, bolts and associated nuts.
7. A seal as claimed in any of claims 1 to 6 wherein the face plate is generally annular in shape as it, together with the main body, surround the pipe in use.
8. A seal as claimed in any of claims 1 to 6 wherein the deformable member and seal are contained within a cassette arrangement.
9. A seal as claimed in any of claims 1 to 8 wherein the deformable member is a ring of elastomeric material such as nitrile rubber.
10. a seal as claimed in any of claims 1 to 9 wherein the seal is of an elastomeric material.
11. A seal as claimed in claim 10 wherein the elastomeric material is a chemically inert material such as polytetrafluoroethylene.
12. A seal as claimed in any of claims 1 to 11 wherein the seal is in the form of a plurality of split rings so that it can be removed and replaced when necessary without having to disconnect the pipework.
13. A seal as claimed in any of claims 1 to 12 additionally comprising an additional seal and clamp operable to reversibly seal the two interstitial spaces from one another.



**FIG. 1**



**FIG. 2**

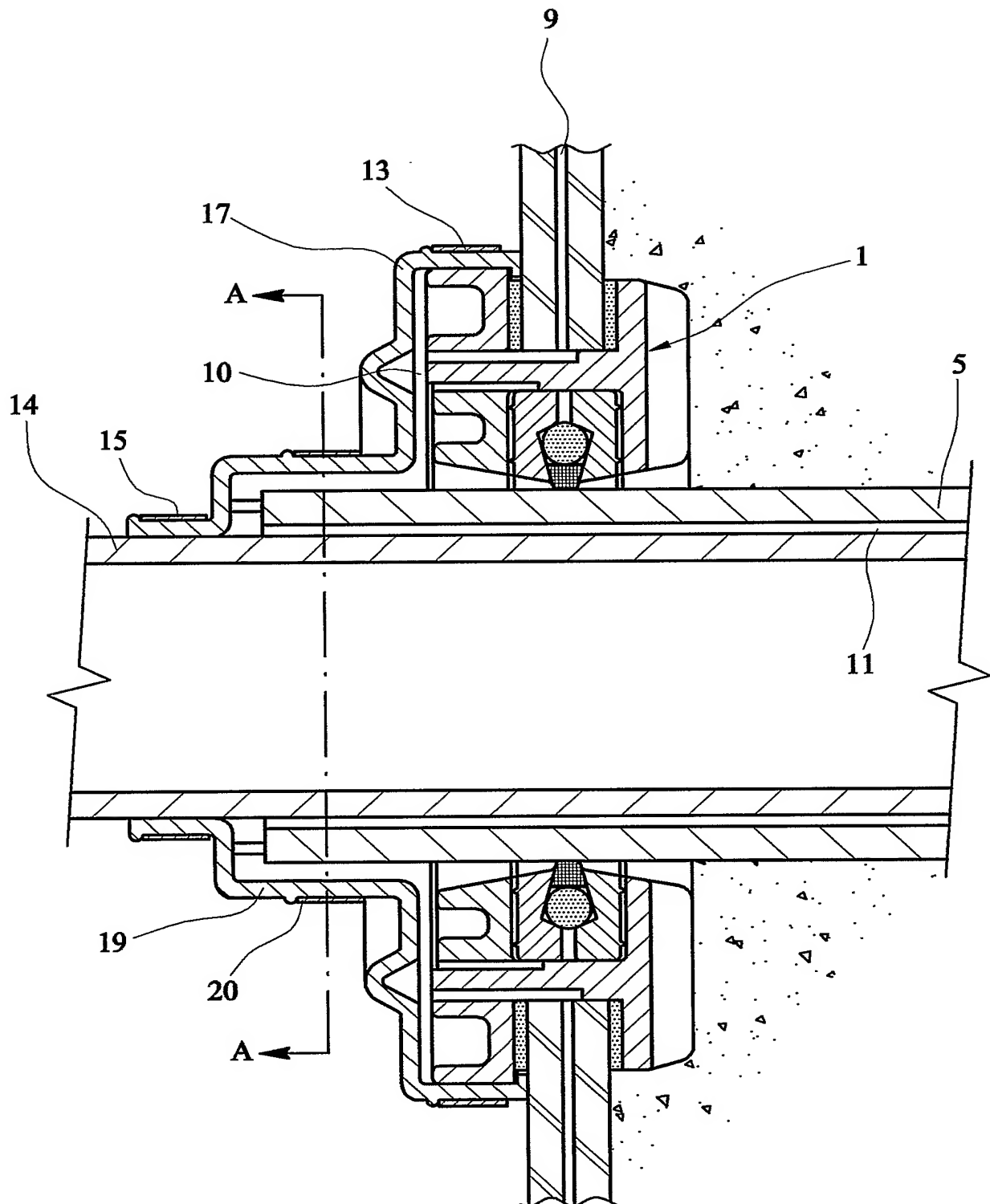


FIG. 3

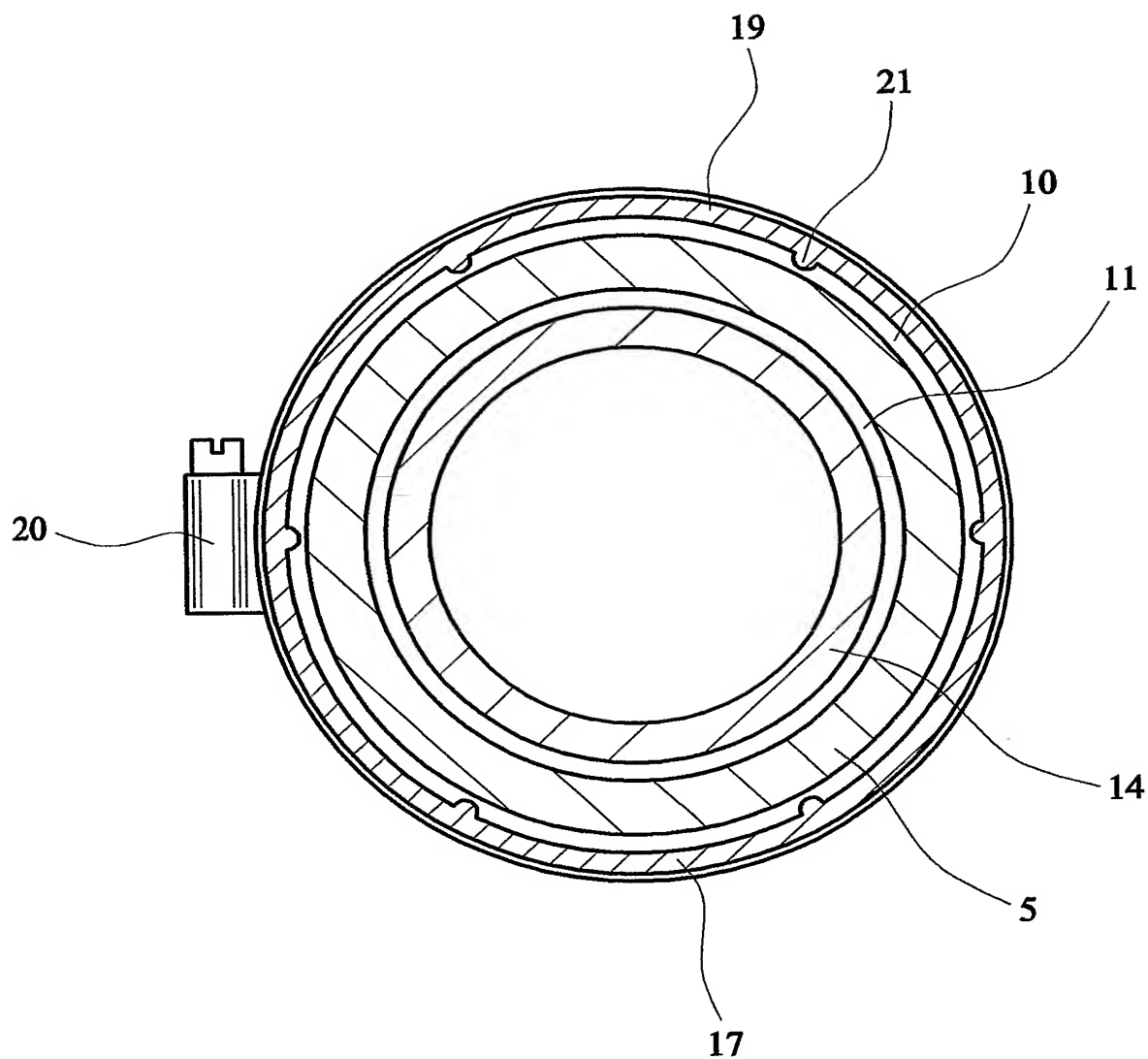


FIG. 4

# INTERNATIONAL SEARCH REPORT

PCT/GB 03/02484

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 F16L5/06 F16L5/08

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 F16L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P, X	WO 02 088588 A (NEWTON JOHN REGINALD) 7 November 2002 (2002-11-07) cited in the application	1-12
A	page 4, paragraph 4 -page 5, paragraph 3 page 6, paragraph 2; figures 1,4-6 ---	13
X	DE 299 06 645 U (DOYMA GMBH & CO) 24 August 2000 (2000-08-24)	1,3,6-11
A	page 6, paragraph 10 -page 7, paragraph 2 page 11, paragraph 2; figure 6 -----	2,4,5, 12,13

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

### \* Special categories of cited documents:

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- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- \*Z\* document member of the same patent family

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

PCT/GB 03/02484

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
WO 02088588	A	07-11-2002	WO	02088588 A1	07-11-2002
DE 29906645	U	24-08-2000	DE	29906645 U1	24-08-2000